

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2017/2018

TAI2151 – ARTIFICIAL INTELLIGENCE FUNDAMENTALS
(All Sections/Groups)

1 June 2018
9.00am – 11.00am
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This question paper consists of 5 pages with 5 questions only.
2. Attempt **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided.

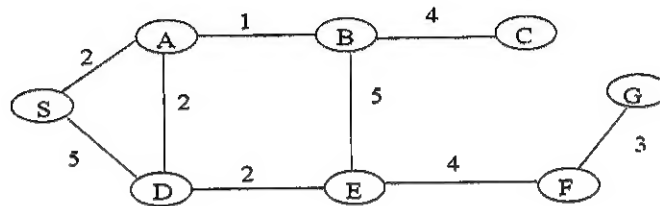
Question 1

- (a) Many people assert that the Turing test is the only legitimate test of machine intelligence. What is a Turing test? What is the most important premise/condition to pass the Turing test? (3 marks)
- (b) The most basic form of agent is purely reactive, whereas an agent based on planning or search is entirely deliberative. Describe the differences between reactive and deliberative agents. (2 marks)
- (c) Answer with justification the tic-tac-toe task environment according to the following properties:
- (i) Is it fully or partially observable? (1 mark)
 - (ii) Is it deterministic or stochastic? (1 mark)
 - (iii) Is it episodic or sequential? (1 mark)
 - (iv) Is it static, dynamic or semi-dynamic? (1 mark)
 - (v) Is it discrete or continuous? (1 mark)

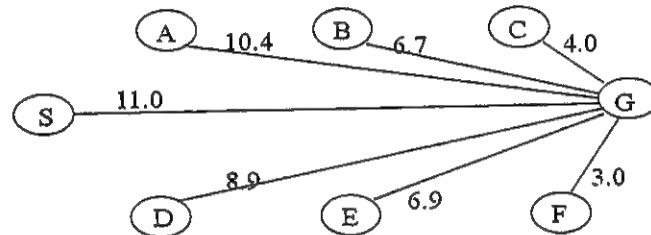
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Question 2

- (a) What is an admissible heuristic function? (2 marks)
- (b) Why the straight-line distance for each node in a graph to the goal node is an admissible heuristic function? (2 marks)
- (c) Given the following map with the actual distances display on it, workout the solution path and the path cost from S to G using A* Search.



The following figure shows the straight-line distances for each node to G:

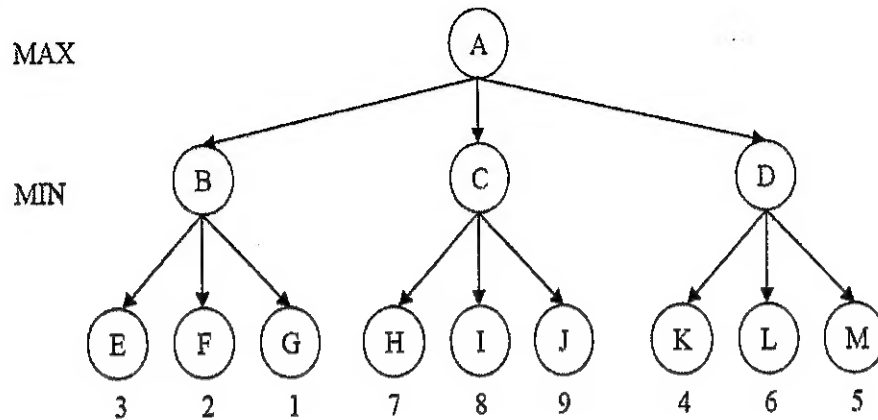


(6 marks)

Continued....

Question 3

Consider this game tree where the root is a maximizing node, and children are visited from left to right.



- (a) Compute the minimax game value of nodes A, B, C, and D using the standard minimax algorithm. (2 marks)
- (b) What move will be selected by player one using minimax? (1 mark)
- (c) List the nodes (leaves or interior nodes) that alpha-beta algorithm prunes (i.e., decides need not be examined). (2 marks)
- (d) The number of nodes that alpha-beta algorithm prunes depends on how each node's children are ordered in the tree.
- (i) How to obtain a new game tree by re-ordering the children of each internal node, such that the new game tree is equivalent to the tree above, but alpha-beta pruning will prune as many nodes as possible?
- (ii) List the nodes that would be pruned. (5 marks)

Continued....

Question 4

You are given the following predicates:

$dog(X)$ = X is a dog

$animal(X)$ = X is an animal

$dies(X)$ = X dies

- (a) Translate the following English sentences into First-Order Logic statements:
1. Fido is a dog.
 2. All dogs are animals.
 3. All animals will die.
- (2 marks)
- (b) Convert the First-Order Logic statements obtained in (a) into Conjunctive Normal Form.
- (2 marks)
- (c) Use resolution refutation to prove that Fido will die.
- (6 marks)

Continued....

Question 5

A decision tree is used for deciding your favourite restaurant. Assume we have two types: Price and Type, where Price has three possible values: Low (L), Medium (M), and High (H); and Type has two possible values: Hamburger (H) and Vegetarian (V). Consider the following training set consisting of five examples:

Example	Attributes		Class
	Price	Type	
1	L	H	+
2	L	V	+
3	M	H	-
4	M	V	+
5	H	V	-

For your information, $\log_2 1 = 0$, $\log_2 2 = 1$, $\log_2 3 = 1.6$, $\log_2 4 = 2$, $\log_2 5 = 2.3$

Also, $\log(x/y) = \log x - \log y$

- (a) Using the Max Gain method, what is the best attribute for the root node of the decision tree? Show all your work. (8 marks)
- (b) Construct the entire decision tree. (2 marks)

End of Paper